(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 622 332 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent: **08.07.1998 Bulletin 1998/28**

(21) Application number: **94906772.2**

(22) Date of filing: **04.08.1993**

(51) Int. Cl.[6]: **B68G 1/00**, B68G 5/00, D04H 1/42, D04H 1/54, D04H 1/00

(86) International application number: **PCT/JP93/01093**

(87) International publication number: **WO 94/03393 (17.02.1994 Gazette 1994/05)**

(54) HEAT AND FLAME RESISTING CUSHION MATERIAL AND SEAT FOR VEHICLE

FEUERFESTES UND HITZEBESTÄNDIGES POLSTERMATERIAL UND SITZE FÜR TRANSPORTMITTEL

MATERIAU DE REMBOURRAGE RESISTANT AU FEU ET A LA CHALEUR ET SIEGE POUR VEHICULE

(84) Designated Contracting States: **DE FR GB**

(30) Priority: **04.08.1992 JP 207990/92**

(43) Date of publication of application: **02.11.1994 Bulletin 1994/44**

(73) Proprietor: **TEIJIN LIMITED**
Osaka-shi, Osaka 541 (JP)

(72) Inventors:
- **YAMAGUCHI, Tatuo**
  Ikeda-shi, Osaka 563 (JP)
- **YOSHIDA, Makoto**
  Ibaraki-shi, Osaka 567 (JP)
- **TAKAHASHI, Nobuo**
  Ikoma-shi, Nara 630-02 (JP)
- **KIMURA, Takeo**
  Ibaraki-shi, Osaka 567 (JP)

(74) Representative:
Wössner, Gottfried et al
Hoeger, Stellrecht & Partner,
Uhlandstrasse 14c
70182 Stuttgart (DE)

(56) References cited:
EP-A- 0 603 853
WO-A-86/06114
WO-A-91/10768
DE-A- 4 222 127
FR-A- 2 346 487
JP-A- 4 272 224
JP-A-61 125 377
JP-B-55 030 875

- **DATABASE WPI Section Ch, Week 8932, Derwent Publications Ltd., London, GB; Class A94, AN 89-232519 & JP-A-1 168 950 (ASAHI CHEMICAL IND KK) 4 July 1989**

EP 0 622 332 B1

Description

Technical Field

This invention relates to a cushioning structure having enhanced heat-resistance and flame-retardancy, and a vehicle seat molded therefrom.

Background Art

In recent years, there is an increasing demand for imparting enhanced heat resistance and flame retardancy to cushioning articles used for, for example, household furniture, beds, particularly beds in hospitals and facilities for old people, and vehicle seats in transport facilities including airplanes. Especially, as is well known, very strict flame retardancy requirements for airplane seats must be satisfied under Federal Aviation Administration (FAA) in the United States for saving a life from the fire.

To meet the above-mentioned demand, flame-retarded polyurethanes are widely used which are made by incorporating a phosphorus-containing flame retardant in a polyurethane-forming material in the process of making polyurethane. However, there is a problem such that, with an enhancement of flame retardancy, a flame-retarded polyurethane cushioning article becomes to feel hard and becomes dense and heavy, and thus, the comfortableness is reduced. Comfortableness and light-weight are always required for cushioning articles, and especially, there is recently a strong demand for light-weight seats of automobiles and airplanes. Further, polyurethane cushioning articles have a problem in industrial waste incineration.

Cushioning articles comprising a wadding of polyester fibers have also been recently used, in which the fibers are either bonded at intersecting points of fibers by a resin binder or a low-temperature-melting fiber binder, or not bonded. The cushioning articles of polyester fibers, which are not bonded at intersecting points of fibers, are apt to be deformed during the use because the wadding is not fixed and the fibers are not restricted in movement, and their bulkiness and resilience are reduced because the crimp of fibers fades away. The cushioning articles of polyester fibers, which are bonded at intersecting points of fibers, also have similar problems to some extent because the bonding at intersecting points of fibers is not stable and the crimp of fibers fades away. Further, in these cushioning articles, with an enhancement of flame-retardancy, the bulkiness and resilience are reduced and the comfortableness becomes lost.

JP-B-55-30875 (corresponding to FR-A-23 46 487) discloses a cushioning structure made of flame-retardant staple fibers and non-elastic polyester staple fibers in the form of a web.

WO-A-86/06114 discloses a cushion core or an aircraft seat made of plastic filaments which are relatively temperature-resistant and which are fusion-bonded at intersecting points of the filaments.

Disclosure of Invention

A primary object of the present invention is to provide a cushioning structure exhibiting an enhanced flame retardancy with a minimized reduction in comfortableness, and having good heat resistance and light-weight and having no problem in industrial waste incineration, and to provide a vehicle seat made the cushioning structure.

In one aspect of the present invention, there is provided a heat-resistant and flame-retardant cushioning structure comprising (a) a matrix composed of a bulky non-woven web of a crimped non-elastic staple fiber, (b) a crimped-flame retardant staple fiber exhibiting a residual weight of at least 35% as tested by a non-flaming heating test method, and (c) a thermoplastic elastic fiber; the crimped flame-retardant staple fiber (b) and the thermoplastic elastic fiber (c) being dispersed in the matrix (a) and at least part of intersecting points of the thermoplastic elastic fiber (c) with the other fibers (a) and (b) are fusion bonded.

In another aspect of the present invention, there is provided a heat-resistant and flame-retardant cushioning structure having a double-layer structure composed of an inner layer of a bulky nonwoven web and an outer layer enveloping the inner layer; said outer layer comprising (a) a matrix composed of a bulky non-woven web of a crimped non-elastic staple fiber, (b) a crimped flame-retardant staple fiber exhibiting a residual weight of at least 35% as tested by a glowing test method, and (c) a thermoplastic elastic fiber; the crimped flame-retardant staple fiber (b) and the thermoplastic elastic fiber (c) being dispersed in the matrix (a) and at least part of intersecting points of the thermoplastic elastic fiber (c) with the other fibers (a) and (b) are fusion bonded.

In still another aspect of the present invention, there is provided a vehicle seat molded from the above-mentioned cushioning structure.

Best Mode for Carrying Out the Invention

The matrix of the cushioning structure of the present invention is composed of a bulky non-woven web of a crimped

non-elastic staple fiber. As preferable examples of the crimped non-elastic staple fiber, there can be mentioned a polyester fiber and an aramid fiber. The crimped non-elastic polyester staple fiber includes, for example, staple fibers or mix d staple fibers of polyethylene terephthalate, polybutylene terephthalate, polytetramethylene terephthalate, poly-1,4-dimethylcyclohexane terephthalate, polyethylene naphthalate, polypivarolactone and copolyesters thereof, polyesters, and composite staple fibers composed of two or more of these polyesters. Preferable polyester fibers have incorporated therein a phosphorus or halogen compound to enhance the flame retardancy and heat resistance. The crimped nonelastic aramid fibers include, for example, a meta-aramid fiber and a para-aramid fiber. Of these, a meta-aramid fiber is preferable because it has not only good flame retardancy and heat resistance but also enhanced mechanical properties such as strength and modulus as well as good crimp-imparting property and crimp-fastness.

The shape of cross-section of the crimped non-elastic staple fiber is not particularly limited, the cross-section may be any of circular, oblong (i.e., fiber is flat), odd-shaped and hollow forms. The crimped non-elastic staple fiber preferably has a thickness of 4 to 300 deniers, more preferably a thickness of 6 to 100 deniers. If the single fiber thickness is too small, the density of the cushioning structure is large and the cushioning structure becomes inelastic. In contrast, if the single fiber thickness is too large, the cushioning structure has poor handling characteristics and the web-forming property becomes deteriorated. Further, a large single fiber thickness leads to reduction in number of fibers in the web, and thus, the cushioning structure becomes inelastic and has a poor durability and a coarse feeling.

The crimp of the non-elastic staple fiber constituting the matrix of the cushioning structure of the present invention is important. Namely, the crimp is an important factor for imparting bulkiness and cushioning characteristics to the cushioning structure and for rendering the cushioning structure light-weight. Preferably, the crimped non-elastic staple fiber has an initial bulkiness of 40 to 120 cm^3/gr, more preferably 50 to 120 cm^3/gr and most preferably 70 to 120 cm^3/gr. Further, the crimped non-elastic staple fiber has a bulkiness under a load of 10 gr/cm^2 of preferably 15 to 50 cm^3/gr, more preferably 20 to 50 gr/cm^3 and most preferably 30 to 50 cm^3/gr. The initial bulkiness and the bulkiness under a load of 10 gr/cm^2 are determined under a load of 0.5 gr/cm^2 and a load of 10 gr/cm^2, respectively, according to JIS 1015. If the initial bulkiness and the bulkiness under a load of 10 gr/cm^2 are larger than the above-mentioned ranges, the staple fiber becomes to card. If these bulkinesses are smaller than the above-mentioned ranges, the cushioning properties become poor.

These bulkinesses can be obtained usually when the number of crimps of the staple fiber is 5 to 15 per inch, preferably 8 to 15 per inch, and the percentage crimp thereof is 15 to 35%, preferably 20 to 35%. The number of crimps and the percentage crimp are determined according to JIS 1015.

The preferred bulkiness is obtained by appropriately selecting the single fiber thickness and the crimp characteristics. With regard to the density which is in inverse proportion to the bulkiness, the density of the cushioning structure is preferably 0.01 to 0.06 gr/cm^3 and more preferably 0.02 to 0.05 gr/cm^3. If the density is smaller than 0.01 gr/cm^3, the structure is too loose and is not springy. If the density exceeds 0.06 gr/cm^3, the structure is springy but is not light-weight.

Another important factor of the cushioning structure is how to set the matrix fibers as a structural body. Namely, the matrix fibers should be set so that the cushioning structure withstands deformation under stress and, when stress is relieved, it is immediately restored to the original shape.

The matrix of the cushioning structure of the present invention is set by thermally bonding thermoplastic elastic fibers. The thermal bonding is beneficial in that the matrix is effectively set and the working atmosphere is good and safe, as compared with a wet bonding procedure using a liquid binder.

The thermal bonding is effected by using a thermoplastic elastic fiber having a melting point much lower, preferably at least 60°C lower, than that of the crimped non-elastic staple fiber constituting the matrix. (the thermoplastic elastic fiber is hereinafter described in detail)

It is to be noted that the matrix of the heat-resistant and flame-retardant cushioning structure of the present invention is set by using a thermoplastic elastic fiber which is not flame-retardant, but the cushioning structure exhibits good heat resistance and flame retardancy. More specifically, this is achieved by dispersing a crimped flame-retardant staple fiber exhibiting a residual weight of at least 35% as tested by a non-flaming heating test method in the matrix composed of a bulky non-woven web of a crimped non-elastic staple fiber. In other words, both the matrix fiber and the flame-retardant staple fiber are thermally set by using a thermoplastic elastic fiber whereby a cushioning structure having good flame retardancy, bulkiness, heat resistance and durability.

The residual weight of the crimped flame-retardant staple fiber is determined according to a non-flaming heating test as follows. An electric heater is provided in a cubic box, each side of which has a size of 50 cm. One gram of a test sample is placed in a cage so that the sample is not dripped when molten, and the cage is placed in the center of the cubic box. The sample is subjected to a thermal decomposition treatment by heating at 750°C for 4 minutes. The heating temperature is measured by using a thermocouple placed on a sample stage. The residual weight is calculated from the weight reduction as measured after the thermal decomposition.

The ratio of the amount of the crimped flame-retardant staple fiber having a residual weight of at least 35% to the amount of the matrix fiber, i.e., the crimped non-elastic staple fiber is preferably in the range of 0.1/1 to 1/1 by weight.

If this ratio is larger than 1/1, the cushioning structure has poor bulkiness and durability. If this ratio is smaller than 0.1/1, the flame retardancy is lowered. Even when a flame retardant staple fiber having a residual weight of 35% or lower is used, flame retardancy can be obtained to some extent if the amount used is large, but the bulkiness and durability of the cushioning structure are considerably lowered.

As examples of the flame-retardant fiber having a residual weight of at least 35%, there can be mentioned a pre-oxidized acrylonitrile polymer fiber which is prepared by pre-oxidizing an acrylonitrile polymer and which is commercially available in the trade name of, for example, "Lastan" and "Pyromex", a completely carbonized carbon fiber, a crosslinked phenolic resin fiber which is commercially available in the tradename of, for example, "Kynol", and polybenzimidazole fiber (PBI). Of these, a pre-oxidized acrylonitile polymer fiber is preferable.

The crimped flame-retardant staple fiber has a single fiber thickness preferably not larger than 8 deniers, more preferably not larger than 5 deniers. If the single fiber thickness is too large, the number of fibers in the web is decreased and thus the flame retardancy is reduced. However, too small single fiber thickness badly influences the web formation, and therefore, the single fiber thickness should preferably be at least about 1 denier.

As hereinbefore described, there can be mentioned a polyester fiber and an aramid fiber as preferable examples of the crimped non-elastic staple fiber used in the cushioning structure of the present invention. The use of a polyester fiber or an aramid fiber in combination with the above-mentioned flame-retardant fiber is described in DE 3307449-A1, GB 2183265 and GB 2152542. However, this combination is used for a continuous yarn such as a spun yarn, and thus, these references teach only that this combination imparts flame retardancy to a two-dimensional fabric. These references are silent on the use of this combination for a three-dimensional fibrous structure, namely, the references suggest nothing about a flame-retardant cushioning structure having good bulkiness and durability.

The cushioning structure of the present invention is characterized in that the above-mentioned crimped flame-retardant staple fiber (b) is dispersed in a matrix composed of a crimped non-elastic staple fiber (a), and further, a thermoplastic elastic fiber (c) is incorporated in the matrix, and that at least part of intersecting points of the thermoplastic elastic fiber (c) with the crimped non-elastic staple fiber (a) and the crimped flame-retardant staple fiber (b) are fusion-bonded. The ratio of the thermoplastic elastic fiber (c) varies depending upon the particular thermoplastic elastic fiber used, but this ratio is preferably 10 to 50% based on the total weight of the cushioning structure. If this ratio is smaller than 10%, the cushioning structure has a good flame retardancy, but the number of fusion-bonded intersecting points are few and hence the durability is poor. If this ratio exceeds 50%, the flame retardancy becomes poor. When the ratio of the thermoplastic elastic fiber is in the range of 10 to 50% based on the total weight, both the crimped non-elastic staple fiber and the crimped flame-retardant staple fiber are fusion-bonded to a considerable extent whereby no laminar separation occurs in the thickness direction of the cushioning structure and the cushioning structure becomes springy and durable.

A preferable thermoplastic elastomer fiber used for the formation of fusion-bonded intersections is a composite fiber made of a thermoplastic elastomer and a non-elastic polyester and having a melting point at least 60°C lower than that of the crimped non-elastic staple fiber constituting the matrix. If the difference in melting point is smaller than 60°C, the thermoplastic elastic fiber is deteriorated when heated, and the elastic fiber tends to badly influence the matrix fiber.

A thermoplastic elastomer occupies preferably at least 1/2 of the surface area of the composite fiber. The ratio of the thermoplastic elastomer to the non-elastic polyester is preferably in the range of 30/70 to 70/30.

The composite fiber may be either a side-by-side type or a sheath-core type, but the latter is preferable. In the sheath-core type composite fiber, the non-elastic polyester forms the core, and the shape of the cross-section of the core may be either concentric circle or eccentric circle. The eccentric circle is more preferable because coil-shaped elastic crimps develop in the composite fiber.

As the thermoplastic elastomer, there can be mentioned, for example, polyurethane elastomers and polyether-polyester elastomers. As the non-elastic polyester, there can be mentioned, for example, polyethylene terephthalate and polybutylene terephthalate. Polybutylene terephthalate having rubber elasticity is especially preferable.

The thermoplastic elastomer fiber should be chosen in due consideration of not only melting point but also cushioning performance. More specifically, when a crimped flame-retardant staple fiber having a small number of crimps is used, large fusion-bonded areas should preferably be formed in the intersecting points thereof. Since the fusion-bonded areas are comprised of the elastomer, the areas can be deformed in accordance with the stress imposed and, when the stress is relieved, the areas can be immediately restored to the original shape. Further, the elastomer fiber exhibits a good recovery from elongation, and, when stress is repeatedly imposed, there is neither breakage nor residual strain. Therefore, although the crimped flame-retardant staple has small crimps, a good cushioning performance can be obtained by the thermoplastic elastomer fiber. In this respect, the thermoplastic elastomer fiber preferably has a single fiber diameter larger than that of the crimped flame-retardant staple fiber.

The thermoplastic elastomer fiber preferably has an elongation at break of at least 500% and a stress at 300% elongation of not larger than 0.6 kg/mm^2, and a recovery at 300% elongation of at least 60%. If the elongation at break is smaller than 500%, the cushioning structure cannot withstand a large stress. If the the stress at 300% elongation exceeds 0.6 kg/mm^2, the deformation of the cushioning structure is not smooth due to the high stress, and the comfort-

ableness is lowered. If the recovery at 300% elongation is smaller than 60%, the recovery after the stress relief is not satisfactory.

In other words, the cushioning structure of the present invention is characterized in that, even when a relatively small amount (i.e., an amount smaller than that of the matrix fiber) of the crimped flame-retardant staple fiber is incorporated in the matrix fiber to provide a cushioning structure passing the FAA standard, an acceptable cushioning performance can be attained by the fact that the crimped matrix staple fiber and the thermoplastic elastic fiber exhibit a synergistic springy action and supplement the small crimps of the flame-retardant staple fibers.

The cushioning structure of the present invention may have a structure which is entirely composed of a substantially uniform mixture of the above-mentioned crimped non-elastic staple fiber, crimped flame-retardant staple fiber and thermoplastic elastomer fiber. Alternatively, the cushioning structure may have a double layer structure composed of inner layer of a bulky non-woven web and an outer layer enveloping the inner layer, which outer layer is composed of the above-mentioned crimped non-elastic staple fiber, crimped flame-retardant staple fiber and thermoplastic elastomer fiber. Although the inner layer of the double layer structure may be composed of the above-mentioned three fibers, a good flame retardancy is imparted by the outer layer, and therefore, the inner layer is preferably composed of the crimped non-elastic staple fiber and the thermoplastic elastomer fiber with due regard to the bulkiness and durability of the entire cushioning structure.

The crimped non-elastic staple fiber used for the inner layer of the preferred double-layered cushioning structure is preferably made of a polyester in view of satisfactory mechanical properties such as strength and modulus as well as good crimping characteristics such as a crimp imparting property and a crimp fastness. The thermoplastic elastomer fiber used in combination with the crimped non-elastic staple fiber for the inner layer is preferably made of an elastomer selected from those which are used for the outer layer. The amount of the thermoplastic elastomer fiber used for the inner layer is preferably 10 to 50% by weight based on the weight of the inner layer in view of the bulkiness and durability of the entire cushioning structure.

The thermoplastic elastomer fibers are incorporated in the inner layer and the outer layer, and hence, the two layers are firmly bonded to each other and the bonded interface between the two layers is not clear. Thus the cushioning structure has a peeling strength of at least 1.0 kg as measured by applying a peel force in the thickness direction, and is very durable. The peeling strength is determined according to ASTM D 3574 wherein a reinforcing fabric is adhered onto a cushioning structure by an adhesive, the adhered assembly is pressed under a pressure of 10 kg/cm^2 for 24 hours, and then the peeling strength is measured on a sample having a width of 25 mm by applying a peel force at a peel rate of 50 mm/min.

The thickness and density of the outer layer of the double layered cushioning structure can be appropriately chosen, but are preferably 3 to 10 mm and 200 to 500 g/m^2, respectively, from viewpoints of flame retardancy and fastness to surface rubbing.

The cushioning structure of the present invention is usually made by a procedure wherein the crimped flame retardant staple fiber and the thermoplastic elastomer fiber are incorporated with a matrix of the crimped non-elastic staple fiber, and at least part of the intersecting points between the thermoplastic elastomer fiber and the crimped non-elastic staple fiber and/or the crimped flame-retardant staple fiber are fusion-bonded whereby the three fibers are formed into an integrated body. For making a uniform cushioning structure having a good performance by a process as short as possible, the crimped non-elastic staple fiber, it is preferable that the crimped flame-retardant staple fiber and the thermoplastic elastomer fiber are combined together and thoroughly mixed, and the mixture is then heat-treated at a temperature 20°C to 60°C higher than the melting point of the thermoplastic elastomer fiber to be thereby fusion-bonded. If the heating temperature is too low, the polymers do not flow in a molten state to the desired extent at intersecting points of staple fibers, with the results of reduction in the number of fusion-bonded points and reduction in rebound of the cushioning structure. If the heating temperature is too high, the thermoplastic elastomer fiber is subject to thermal deterioration and the physical properties at the thermally bonded points are degraded.

The heat-resistant and flame-retardant cushioning structure having a double layer structure is made by a procedure wherein a bulky nonwoven web for the inner layer and that for the outer layer are separately prepared by combining together and mixing thoroughly the respective fibers, the bulky nonwoven web of the inner layer is enveloped by the bulky nonwoven web of the outer layer, and the combined bulky nonwoven webs are heat-treated in the above-mentioned manner whereby the fibers are fusion-bonded.

The cushioning structure is molded into a vehicle seat and other cushion articles. A vehicle seat is made by a process wherein a non-heat-treated bulky web of mixed fibers is packed in a mold and then heat-treated, or a process wherein fibers are combined together and mixed, the thus-obtained mixed web is heat-treated at a temperature lower than the heat-treating temperature for fusion-bonding whereby the web is temporarily bonded, the web is then cut to a shape approximately similar to a mold cavity, the cut web is packed in the mold, and the packed web is heat-treated to effect fusion-bonding, or a process wherein fibers are combined together and mixed to form a web, the web is heat-treated to effect fusion-bonding, the fusion-bonded web is cut into several parts, and the parts are adhered by using a binder and simultaneously molded in a mold. Other processes can be employed such as, for example, a process using

a sliver as described in EP 0483386-A1 and a process comprising blowing fibers in a mold as described in JP-A 3-121091.

By the term "vehicle seat" used herein we mean seats in a broad sense, which include seats of an automobil and other land transport facilities and seats of airplanes.

The cushioning structure of the present invention will now be described by the following examples. Characteristics of fibers and cushioning structures are determined as follows.

(1) Characteristics of fibers

(a) Fiber thickness (denier), number of crimps (CN) and percentage crimp (CD) are determined according to JIS 1015.
(b) Initial bulkiness and bulkiness under load are determined according to JIS 1097 wherein bulkiness (cm^3/gr) is measured under a load of 0.5 gr/cm^2 and a load of 10 gr/cm^2, respectively.

(2) Characteristics of cushioning structure

(a) Density is determined according to JIS K 6401.
(b) Rebound is determined according to JIS K 6401.
(c) Compression residual strain is determined at 50% compression or after compression is repeated 80,000 times according to JIS K 6401.
(d) Air permeability is determined according to JIS L 1079.
(e) FAA flame retardancy test is carried out according a combustion test employed in the U.S. Federal Aviation Administration, i.e., Federal Aviation Regulation, part 25 (25.853) (Airworthiness Standards, Transport Category Air Planes published June 1974, by U.S. Department of Transportation. The acceptable limits in the FAA combustion test are weight reduction of not larger than 10%, distance burned at bottom of not longer than 46 cm and distance burned at back of not longer than 43 cm.

Example 1

Meta-aramid fiber ("Conex" supplied by Teijin Ltd.) was used as a crimped non-elastic staple fiber for a matrix; a pre-oxidized polyacrylonitrile fiber exhibiting a residual weight of 48% as measured according to a glowing test ("Lastan", 2 deniers x 74 mm) was used as a crimped flame-retardant staple fiber; and a composite fiber made as follows was used as a thermoplastic elastomer fiber.

Mixed acid component composed of terephthalic acid and isophthalic acid (80/20 by mole) and butylene glycol were polymerized to yield polybutylene terephthalate. 38% by weight of the polybutylene terephthalate and 62% by weight of polybutylene glycol having a molecular weight of 2,000 were heated to form a block co-polyether-polyester elastomer. This thermoplastic elastomer had an intrinsic viscosity of 1.0, a melting point of 155°C, an elongation at break of 1,500% (as measured on a film), a stress at 300% elongation of 0.3 kg/mm^2 and a recovery at 300% elongation of 75%.

An eccentric sheath-core composite fiber was made by a conventional melt-spinning process using 50% by weight of the above-mentioned thermoplastic elastomer as the sheath and 50% by weight of polybutylene terephthalate as the core. The composite fiber was drawn twice the original length, cut into a length of 64 mm, and heat-treated in hot water at 95°C whereby the shrinkage of the composite fiber was reduced and crimps were developed. After drying the treated fiber, an oiling agent was applied to the fiber. This thermoplastic elastomer fiber had a single fiber thickness of 6 deniers.

A matrix mixed fiber composed of Conex and Lastan at a ratio of 1 : 0.2 was mixed with the above-mentioned thermoplastic elastomer staple fiber to form a web at a mixing ratio of 70% by weight and 30% by weight, respectively, by a card. A plurality of the webs were superposed in a square plate-shaped mold so that the thickness and density of the superposed webs are 10 cm and 0.05 g/cm^3, respectively. The webs were heat-treated at 200°C for 10 minutes to obtain a cushioning structure having a square plate shape. This procedure was repeated wherein three kinds of Conex fibers having the same thickness (13 deniers) and staple length (76 mm), but having different crimp characteristics were separately used. The results are shown in Table I-1 (Run No. 1 to 3).

Example 2

The procedure of Example 1, Run No. 2 was repeated wherein the ratio of Conex to Lastan was changed as shown in Table I-1 with all other conditions remaining the same. The results are shown in Table I-1 (Run No. 4 and 5).

Example 3

The procedure of Example 1, Run No. 2 was repeated wherein the ratio of the thermoplastic elastomer fiber to the entire amount of the three fibers was changed as shown in Table I-2 with all other conditions remaining the same. The results are shown in Table I-2 (Run No. 6).

Example 4

The procedure of Example 1, Run No. 2 was repeated wherein the heat treating temperature was changed as shown in Table I-2 with all other conditions remaining the same. The results are shown in Table I-2 (Run No. 7).

Example 5

The procedure of Example 1, Run No. 2 was repeated wherein a crosslinked phenolic resin fiber ("Kynol") having a thickness of 3 deniers and a staple length of 70 mm) and a crosslinked melamine resin ("Basofil") having a thickness of 2.3 deniers and a staple length of 75 mm were separately used with all other conditions remaining the same. Run No. 9 is a comparative example which does not fall within the scope of claims. The results are shown in Table I-2 (Run No. 8 and 9).

Example 6

The procedure of Example 1, Run No. 2 was repeated wherein (i) a polyethylene terephthalate (PET) fiber having a thickness of 14 denier and a staple length of 64 mm, (ii) a fiber of polyethylene terephthalate (PET) having copolymerized therein 0.7% by weight of a phosphorus compound, which had a thickness of 13 deniers and a staple length of 51 mm and (iii) a poly-1,4-dimethylcyclohexane terephthalate (PCT) fiber having a thickness of 25 deniers and a staple length of 76 mm were separately used as the matrix staple fiber, and the ratio of the flame-retardant staple fiber to the matrix staple fiber was changed as shown in Table II-1, Run No. 10 to 12, with all other conditions remaining the same. The results are shown in Table II-1 (Run No. 10 to 12).

Example 7

A square plate-shaped cushioning structure having a double layer structure composed of an outer layer A and an inner layer B was made as follows.

A meta-aramid fiber ("Conex") having a thcikness of 13 deniers and a staple length of 76 mm as a matrix fiber and having characteristics shown in Table II-2, Run No. 13 was mixed together with a flame-retardant staple fiber and a thermoplastic elastomer fiber, which fibers and mixing ratio were shown in Table II-2, Run No. 13, by a card to obtain a web A for the outer layer A. 70% by weight of a polyethylene terephthalate (PET) fiber having a thickness of 14 deniers and a staple length of 64 mm and having characteristics shown in Table II-1, Run No. 10, as a matrix fiber and 30% by weight of the same thermoplastic elastomer fiber as that used in Example 1 were mixed together by a card to obtain a web B for the inner layer B. The web B was enveloped by the web A and the combined webs were packed at a thickness of 10 cm in a mold of a square plate shape. The combined webs A and B were heat-treated in the mold at 200°C for 15 minutes to obtain a square plate-shaped cushioning structure having a double layer structure. This procedure was repeated wherein the thickness and basis weight of the outer layer A were changed as shown in Table II-2, Run No. 13 to 15. The results are shown in Table II-2, Run No. 13 to 15.

Example 8

The procedure of Example 7, Run No. 13 for the production of a cushioning structure having a double layer structure was repeated wherein a poly-1,4-dimethylcyclohexane terephthalate fiber having a thickness of 25 deniers and a staple length of 76 mm and having characteristics shown in Table II-1, Run No. 12 was used as the matrix fiber for the inner layer B with all other conditions remaining the same. The results are shown in Table II-2, Run No. 16.

Table I-1

Run No.	1	2	3	4	5
Fibers					
(a) Matrix fiber	Aramid	Aramid	Aramid	Aramid	Aramid
Thickness (denier)	13	13	13	13	13
No. of crimps (CN) (No./inch)	6	8	14	8	8
Percentage crimp (CD) (%)	16	20	30	20	20
Initial bulkiness (cm^3/gr)	45	60	85	60	60
Bulkiness under load (cm^3/gr)	17	25	40	25	25
(b) Flame-retardant fiber	Lastan	Lastan	Lastan	Lastan	Lastan
Residual wt. at glowing test (%)	48	48	48	48	48
Ratio of (a)/(b)	1/0.2	1/0.2	1/0.2	1/0.3	1/0.7
(c) Elastomer fiber	SC-comp	SC-comp	SC-comp	SC-comp	SC-comp
Melting point (°C)	155	155	155	155	155
Ratio of (c)/[(a)+(b)+(c)] (%)	30	30	30	30	30
Heat-treating temperature	200	200	200	200	200
Cushioning structure					
Density (gr/cm^3)	0.050	0.052	0.052	0.052	0.052
Rebound (%)	55	62	67	60	56
Residual strain at 50% compression (%)	16.2	15.5	14.3	15.8	16.4
Residual starin after repeat of compression 800,000 times (%)	8.9	7.6	6.1	8.0	9.2
Air permeability (cc/cm^2 • sec)	120	122	120	105	98
FAA test					
Weight reduction (%)	6.5	6.3	6.2	5.8	5.1
Burned distance, bottom (cm)	22	22	21	20	16
Burned distance, back (cm)	39	40	38	35	38

Note Matrix fiber "Aramid": Meta-aramid fiber
Elastomer fiber "SC comp.": Sheath-core composite fiber composed of polybutylene terephthalate core and block copolypolyether-polyester elastomer sheath.

Table I-2

Run No.	6	7	8	9
Fibers				
(a) Matrix fiber	Aramid	Aramid	Aramid	Aramid
Thickness (denier)	13	13	13	13
No. of crimps (CN) (No./inch)	8	8	8	8
Percentage crimp (CD) (%)	20	20	20	20
Initial bulkiness (cm^3/gr)	60	60	60	60
Bulkiness under load (cm^3/gr)	25	25	25	25
(b) Flame-retardant fiber	Lastan	Lastan	kynol	Basofil
Residual wt. at glowing test (%)	48	48	39	28
Ratio of (a)/(b)	1/0.2	1/0.2	1/0.2	1/0.2
(c) Elastomer fiber	SC-comp	SC-comp	SC-comp	SC-comp
Melting point (°C)	155	155	155	155
Ratio of (c)/[(a)+(b)+(c)](%)	15	30	30	30
Heat-treating temperature	200	210	200	200
Cushioning structure				
Density (gr/cm^3)	0.051	0.053	0.052	0.051
Rebound (%)	56	65	64	63
Residual strain at 50% compression (%)	18.0	16.2	14.9	14.6
Residual starin after repeat of compression 800,000 times (%)	9.1	8.3	7.3	7.5
Air permeability (cc/cm^2 • sec)	110	125	122	118
FAA test				
Weight reduction (%)	5.8	6.4	8.5	15.6
Burned distance, bottom (cm)	22	22	36	46
Burned distance, back (cm)	38	40	42	48

Note Matrix fiber "Aramid": Meta-aramid fiber
Elastomer fiber "SC comp.": Sheath-core composite fiber composed of polybutylene terephthalate core and block co-polypolyether-polyester elastomer sheath

Table II-1

Run No.	10	11	12
Fibers			
(a) Matrix fiber	PET	PET	PCT
Thickness (denier)	14	13	25
No. of crimps (CN) (No./inch)	12	9	9
Percentage crimp (CD) (%)	32	25	26
Initial bulkiness (cm^3/gr)	73	70	60
Bulkiness under load (cm^3/gr)	35	21	30
(b) Flame-retardant fiber	Lastan	Lastan	Lastan
Residual wt. at glowing test (%)	48	48	48
Ratio of (a)/(b)	1/0.6	1/0.4	1/0.6
(c) Elastomer fiber	SC-comp	SC-comp	SC-comp
Melting point (°C)	155	155	155
Ratio of (c)/[(a)+(b)+(c)] (%)	30	30	30
Heat-treating temperature	200	200	200
Cushioning structure			
Density (gr/cm^3)	0.052	0.053	0.050
Rebound (%)	68	66	72
Residual strain at 50% compression (%)	14.2	14.7	13.6
Residual starin after repeat of compression 800,000 times (%)	5.6	6.2	5.1
Air permeability (cc/cm^2 • sec)	113	112	115
FAA test			
Weight reduction (%)	8.5	7.0	8.2
Burned distance, bottom (cm)	30	21	28
Burned distance, back (cm)	43	39	40

Note Matrix fiber "PET": Polyethylene terephthalate fiber
"PCT": Poly-1,4-dimethylcyclohexane terephthalate fiber
Elastomer fiber "SC comp.": Sheath-core composite fiber composed of polybutylene terephthalate core and block co-polypolyether-polyester elastomer sheath

Table II-2

Run No.		13	14	15	16
Fibers					
(a) Matrix fiber		Aramid	Aramid	Aramid	Aramid
Thickness (denier)		13	13	13	13
No. of crimps (CN) (No./inch)		7	7	7	7
Percentage crimp (CD) (%)		17	17	17	17
Initial bulkiness (cm^3/gr)		55	55	55	55
Bulkiness under load (cm^3/gr)		20	20	20	20
(b) Flame-retardant fiber		Lastan	Lastan	Lastan	Lastan
Residual wt. at glowing test (%)		48	48	48	48
Ratio of (a)/(b)		1/0.9	1/0.9	1/0.9	1/0.9
(c) Elastomer fiber		SC-comp	SC-comp	SC-comp	SC-comp
Melting point (°C)		155	155	155	155
Ratio of (c)/[(a)+(b)+(c)] (%)		20	20	20	20
Heat-treating temperature		200	200	200	200
Outer layer,	thickness (mm)	4	8	4	4
	basis weight (g/m^2)	300	300	450	300
Cushioning structure					
Density (gr/cm^3)		0.045	0.046	0.047	0.049
Rebound (%)		59	58	58	63
Residual strain at 50% compression (%)		15.3	15.4	15.5	14.8
Residual starin after repeat of compression 800,000 times (%)		7.8	8.0	8.2	6.0
Air permeability ($cc/cm^2 \cdot sec$)		110	105	90	108
FAA test					
Weight reduction (%)		4.5	4.0	3.8	4.2
Burned distance, bottom (cm)		11	10	9	10
Burned distance, back (cm)		41	38	35	40

Note Matrix fiber "Aramid": Meta-aramid fiber
Elastomer fiber "SC comp.": Sheath-core composite fiber composed of PET core and block co-polypolyether-polyester elastomer sheath

Industrial Applicability

The cushioning structure of the present invention can be made without the use of an injurious material such as freon, and has a good air permeability and thus is not stuffy. The cushioning structure exhibits cushioning characteristics such that the initial density upon compression is not too high, the rebound is large. The rebound increases approximately in direct proportion to the degree of compression and the cushioning structure is not bottomed out. With regard to waste disposal, which has become the object of public attention, the cushioning structure can be incinerated without generation of harmful gas, which is in contrast to a conventional cushioning structure made of polyurethane. As compared with the cushioning structure made of flame-retardant polyurethane which is recently used for seats of airplanes, the cushioning structure of the present invention has benefits not only in the above-mentioned cushioning characteris-

tics and the ease in incineration, but also in meeting with the demand of lightweight which is recently requested. This is in contrast to the flame-retardant polyurethane which has a great problem such that it must be densified to at least 0.060 g/cm^2. Thus, the cushioning structure of the present invention is very useful for seats of various vehicles.

Recently a cushioning structure has been proposed which is composed of a fiber web made of a polyester fiber and in which at least part of the intersecting points of fibers are fusion-bonded by a binder fiber such as an elastomer fiber. This cushioning structure exhibits good cushion characteristics, but has a problem in flame-retardancy. In contrast, the cushioning structure of the present invention has good and balanced cushion characteristics and flame-retardancy and is comfortable.

The cushioning structure of the present invention is beneficial also in that a uniform cushioning structure can be made by a short and simple process wherein a bulky web of staple fibers is heat-treated.

The cushioning structure of the present invention has good flame retardancy, cushioning properties, durability, form stability, air permeability (i.e., reduced stuffiness), uniformity in processing and a wide processability.

Therefore, the cushioning structure is useful for general furniture and beds and especially useful for furniture and beds in hospitals and facilities for old people, vehicle seats such as seats of subway, ships, super-express trains, airplanes and racing cars. It is also used as other flame-retardant paddings and for miscellaneous goods.

Especially the cushioning structure of the present invention is useful as cushion materials for which good cushioning characteristics and a high flame retardancy are required. The high flame retardancy is, for example, that satisfying the requirement for airplanes according to FAA combustion test wherein a cushion structure is placed in contact with a flame for 2 minutes by using a burner producing a flame at 1,038°C which is placed at a distance of 102 mm from the cushioning structure.

Claims

1. A heat-resistant and flame-retardant cushioning structure comprising (a) a matrix composed of a bulky non-woven web of a crimped non-elastic staple fiber, (b) a crimped flame-retardant staple fiber characterising in that the crimped flame-retardant staple fiber exhibits a residual weight of at least 35% to the amount of the matrix fiber as tested by a non-flaming heating test method, said structure comprising (c) a thermoplastic elastic fiber; the crimped flame-retardant staple fiber (b) and the thermoplastic elastic fiber (c) being dispersed in the matrix (a) and at least part of intersecting points of the thermoplastic elastic fiber (c) with the other fibers (a) and (b) are fusion-bonded.

2. A heat-resistant and flame-retardant cushioning structure as claimed in claim 1, wherein the crimped flame-retardant staple fiber (b) is at least one fiber selected from the group consisting of a pre-oxidized acrylonitrile polymer fiber, a carbon fiber, a crosslinked phenolic resin fiber and polybenzimidazole fiber.

3. A heat-resistant and flame-retardant cushioning structure as claimed in claim 1 or 2, wherein the crimped flame-retardant staple fiber (b) has a single-fiber thickness of not larger than 8 deniers.

4. A heat-resistant and flame-retardant cushioning structure as claimed in any preceding claim, wherein the crimped flame-retardant staple fiber (b) has a single-fiber thickness smaller than that of the thermoplastic elastic fiber (c).

5. A heat-resistant and flame-retardant cushioning structure as claimed in any preceding claim, wherein the ratio of the amount of the crimped flame-retardant staple fiber (b) to the amount of the crimped non-elastic staple fiber (a) is in the range of 0.1/1 to 1/1.

6. A heat-resistant and flame-retardant cushioning structure as claimed in any preceding claim, wherein the amount of the thermoplastic elastic fiber (c) is 10 to 50% by weight based on the weight of the cushioning structure.

7. A heat-resistant and flame-retardant cushioning structure as claimed in any preceding claim, wherein the crimped non-elastic staple fiber (a) is selected from the group consisting of polyester fibers and aramid fibers.

8. A heat-resistant and flame-retardant cushioning structure as claimed in any preceding claim, wherein the crimped non-elastic staple fiber (a) has a single-fiber thickness of 4 to 300 deniers, an initial bulkiness of 40 to 120 cm^3/g and a bulkiness of 15 to 50 cm^3/g under a load of 10 gr/cm^2.

9. A heat-resistant and flame-retardant cushioning structure as claimed in any preceding claim, wherein the peeling strength of the cushioning structure as determined in the thickness direction is at least 1.0 kg.

10. A heat-resistant and flame-retardant cushioning structure characterising in that said structure has a double-layer

structure composed of an inner layer of a bulky non-woven web and an outer layer enveloping the inner layer; said outer layer comprising a cushioning structure according to anyone of claims 1 to 9.

11. A heat-resistant and flame-retardant cushioning structure as claimed in claim 10, wherein the amount of the thermoplastic elastic fiber (c) is 10 to 50% by weight based on the weight of the outer layer.

12. A heat-resistant and flame-retardant cushioning structure as claimed in claim 10 or 11, wherein the outer layer has a thickness of 3 to 10 mm and a basis weight of 200 to 500 g/m^2.

13. A heat-resistant and flame-retardant cushioning structure as claimed in any of claims 10 to 12, wherein the bulky non-woven web of the inner layer is composed of a crimped polyester staple fiber or a fibrous mixture predominantly comprising a crimped polyester staple fiber.

14. A heat-resistant and flame-retardant cushioning structure as claimed in any of claims 10 to 13, wherein a thermoplastic elastic fiber is dispersed not only in the outer layer but also in the bulky non-woven web of the inner layer, and the inner layer is bonded to the outer layer.

15. A vehicle seat characterising in that said seat is molded from a heat-resistant and flame-retardant cushioning structure according to anyone of claims 1 to 9 or having a double-layer structure according to anyone of claims 10 to 14.

16. A vehicle seat as claimed in claim 15, which is an airplane seat.

17. A vehicle seat as claimed in claim 15, which is a racing-car seat.

Patentansprüche

1. Wärmebeständige und flammhemmende Polsterstruktur, umfassend (a) eine Matrix, welche aus einem bauschigen non-woven Material aus einer gekräuselten, nichtelastischen Stapelfaser zusammengesetzt ist, (b) eine gekräuselte, flammhemmende Stapelfaser, dadurch gekennzeichnet, daß die gekräuselte, flammhemmende Stapelfaser ein Rückstandsgewicht von mindestens 35 % der Menge der Matrixfasern aufweist, gemessen mittels eines flammlosen Wärmetestverfahrens, wobei die Struktur eine thermoplastische elastische Faser (c) umfaßt; wobei die gekräuselte flammhemmende Stapelfaser (b) und die thermoplastische elastische Faser (c) in der Matrix (a) verteilt sind und wobei mindestens ein Teil der Überkreuzungspunkte der thermoplastischen elastischen Fasern (c) mit den anderen Faser (a) und (b) schmelzgeklebt sind.

2. Wärmebeständige und flammhemmende Polsterstruktur nach Anspruch 1, worin die gekräuselte flammhemmende Stapelfaser (b) mindestens eine Faser ist, ausgewählt aus der Gruppe, bestehend aus einer voroxidierten Acrylnitrilpolymerfaser, einer Carbonfaser, einer vernetzten Phenolharzfaser und Polybenzimidazolfaser.

3. Wärmebeständige und flammhemmende Polsterstruktur nach Anspruch 1 oder 2, worin die gekräuselte, flammhemmende Stapelfaser (b) eine Dicke der einzelnen Faser von nicht mehr als 8 Denier aufweist.

4. Wärmebeständige und flammhemmende Polsterstruktur nach einem der voranstehenden Ansprüche, worin die gekräuselte, flammhemmende Stapelfaser (b) eine Dicke der Einzelfaser aufweist, welche geringer ist als die der thermoplastischen elastischen Faser (c).

5. Wärmebeständige und flammhemmende Polsterstruktur nach einem der voranstehenden Ansprüche, worin das Verhältnis der Menge an gekräuselten, flammhemmenden Stapelfasern (b) zur Menge der gekräuselten nichtelastischen Stapelfasern (a) im Bereich von 0,1/1 bis 1/1 liegt.

6. Wärmebeständige und flammhemmende Polsterstruktur nach einem der voranstehenden Ansprüche, worin die Menge an thermoplastisch elastischer Faser (c) 10 bis 50 Gew.-% beträgt, bezogen auf das Gewicht der Polsterstruktur.

7. Wärmebeständige und flammhemmende Polsterstruktur nach einem der voranstehenden Ansprüche, worin die gekräuselte nichtelastische Stapelfaser (a) ausgewählt ist aus der aus Polyesterfasern und Aramidfasern bestehenden Gruppe.

8. Wärmebeständige und flammhemmende Polsterstruktur nach einem der voranstehenden Ansprüche, worin die gekräuselte nichtelastische Stapelfaser (a) einen Durchmesser der einzelnen Faser von 4 bis 300 Denier aufweist, eine anfängliche Bauschigkeit von 40 bis 120 cm^3/g und eine Bauschigkeit von 15 bis 50 cm^3/g unter einer Last von 10 g/cm^2.

9. Wärmebeständige und flammhemmende Polsterstruktur nach einem der voranstehenden Ansprüche, worin die Abziehfestigkeit der Polsterstruktur, in Richtung ihrer Dicke bestimmt, mindestens 1,0 kg beträgt.

10. Wärmebeständige und flammhemmende Polsterstruktur, dadurch gekennzeichnet, daß die Struktur eine Doppellagenstruktur aufweist, welche aus einer inneren Schicht aus einem bauschigen non-woven Material und einer äußeren Schicht, welche die innere Schicht einhüllt, besteht, worin die äußere Schicht eine Polsterstruktur nach einem der Ansprüche 1 bis 9 umfaßt.

11. Wärmebeständige und flammhemmende Polsterstruktur nach Anspruch 10, worin die Menge an der thermoplastisch elastischen Faser (c) 10 bis 50 Gew.-% beträgt, bezogen auf das Gewicht der äußeren Schicht.

12. Wärmebeständige und flammhemmende Polsterstruktur nach Anspruch 10 oder 11, worin die äußere Schicht eine Dicke von 3 bis 10 mm und ein Flächengewicht von 200 bis 500 g/m^2 aufweist.

13. Wärmebeständige und flammhemmende Polsterstruktur nach einem der Ansprüche 10 bis 12, worin das bauschige non-woven Material der inneren Schicht aus einer gekräuselten Polyesterstapelfaser oder einer faserigen Mischung, welche vorwiegend eine gekräuselte Polyesterstapelfaser umfaßt, zusammengesetzt ist.

14. Wärmebeständige und flammhemmende Polsterstruktur nach einem der Ansprüche 10 bis 13, worin eine thermoplastische elastische Faser nicht nur in der äußeren Schicht, sondern auch in dem bauschigen non-woven Material der inneren Schicht verteilt vorliegt, und worin die innere Schicht mit der äußeren Schicht verbunden ist.

15. Fahrzeugsitz, dadurch gekennzeichnet, daß der Sitz aus einer wärmebeständigen und flammhemmenden Polsterstruktur gemäß einem der Ansprüche 1 bis 9 gebildet ist oder eine Doppellagenstruktur gemäß einem der Ansprüche 10 bis 14 aufweist.

16. Fahrzeugsitz nach Anspruch 15, welcher ein Flugzeugsitz ist.

17. Fahrzeugsitz nach Anspruch 15, welcher ein Rennwagensitz ist.

Revendications

1. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation comprenant (a) une matrice constituée d'un tissu non-tissé volumineux d'une fibre coupée, non élastique, frisée, (b) une fibre coupée, retardatrice d'inflammation, frisée, caractérisée en ce que la fibre coupée, retardatrice d'inflammation, frisée présente un poids résiduel d'au moins 35% par rapport à la quantité de la fibre de matrice, testé par un procédé de test de chauffage ininflammable, ladite structure comprenant (c) une fibre élastique thermoplastique; la fibre coupée, retardatrice d'inflammation, frisée (b) et la fibre élastique thermoplastique (c) étant dispersées dans la matrice (a) et au moins une partie des points d'intersection de la fibre élastique thermoplastique (c) avec les autres fibres (a) et (b) est liée par fusion.

2. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon la revendication 1, dans laquelle la fibre coupée, retardatrice d'inflammation, frisée (b) est au moins une fibre choisie parmi une fibre de polymère d'acrylonitrile pré-oxydé, une fibre de carbone, une fibre de résine phénolique réticulée et une fibre de polybenzimidazole.

3. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon la revendication 1 ou 2, dans laquelle la fibre coupée, retardatrice d'inflammation, frisée (b) présente une épaisseur de la fibre individuelle qui n'est pas supérieure à 8 deniers.

4. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon l'une quelconque des revendications précédentes, dans laquelle la fibre coupée, retardatrice d'inflammation, frisée (b) présente une épaisseur de la fibre individuelle inférieure à celle de la fibre élastique thermoplastique (c).

5. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon l'une quelconque des revendications précédentes, dans laquelle le rapport de la quantité de la fibre coupée, retardatrice d'inflammation, frisée (b) à la quantité de la fibre coupée, non élastique, frisée (a) se trouve dans l'intervalle de 0,1/1 à 1/1.

6. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon l'une quelconque des revendications précédentes, dans laquelle la quantité de la fibre élastique thermoplastique (c) est de 10 à 50% en poids, rapportés au poids de la structure de rembourrage.

7. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon l'une quelconque des revendications précédentes, dans laquelle la fibre coupée, non élastique, frisée (a) est choisie parmi des fibres de polyester et des fibres d'aramide.

8. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon l'une quelconque des revendications précédentes, dans laquelle la fibre coupée, non élastique, frisée (a) présente une épaisseur de la fibre individuelle de 4 à 300 deniers, un encombrement initial de 40 à 120 cm^3/g et un encombrement de 15 à 50 cm^3/g sous une charge de 10 g/cm^2.

9. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon l'une quelconque des revendications précédentes, dans laquelle la résistance au détachement de la structure de rembourrage déterminée dans la direction de l'épaisseur est d'au moins 1,0 kg.

10. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation caractérisée en ce que ladite structure présente une structure à deux couches constituée d'une couche interne d'un tissu non-tissé volumineux et d'une couche externe enveloppant la couche interne; ladite couche externe comprenant une structure de rembourrage selon l'une quelconque des revendications 1 à 9.

11. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon la revendication 10, dans laquelle la quantité de la fibre élastique thermoplastique (c) est de 10 à 50% en poids, rapportés au poids de la couche externe.

12. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon la revendication 10 ou 11, dans laquelle la couche externe présente une épaisseur 3 à 10 mm et un poids de base de 200 à 500 g/m^2.

13. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon l'une quelconque des revendications 10 à 12, dans laquelle le tissu non-tissé volumineux de la couche interne est constitué d'une fibre coupée de polyester, frisée ou d'un mélange fibreux comprenant de manière prédominante une fibre coupée de polyester, frisée.

14. Structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon l'une quelconque des revendications 10 à 13, dans laquelle une fibre élastique thermoplastique est dispersée non seulement dans la couche externe mais également dans le tissu non-tissé volumineux de la couche interne et la couche interne est liée à la couche externe.

15. Siège pour véhicule caractérisé en ce que ledit siège est moulé à partir d'une structure de rembourrage résistante à la chaleur et retardatrice d'inflammation selon l'une quelconque des revendications 1 à 9 ou présente une structure à deux couches selon l'une quelconque des revendications 10 à 14.

16. Siège pour véhicule selon la revendication 15, lequel est un siège d'avion.

17. Siège pour véhicule selon la revendication 15, lequel est un siège de voiture de course.